

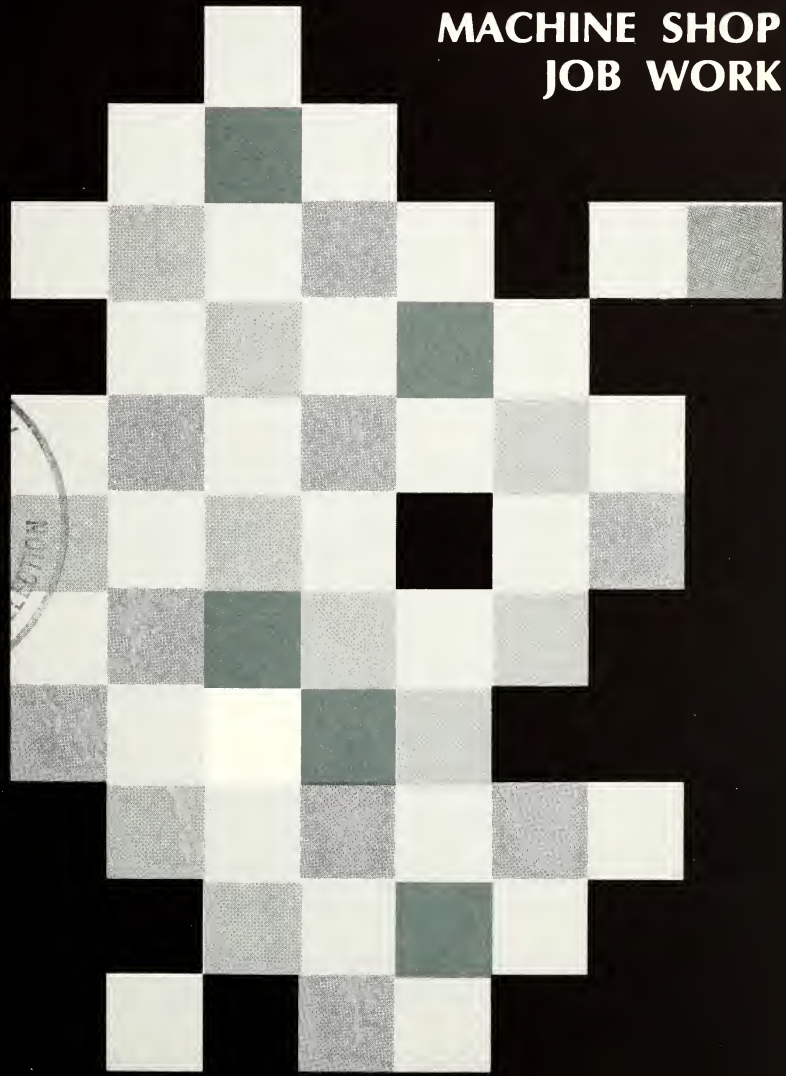
C46.27: M11

A UNITED STATES
DEPARTMENT OF
COMMERCE
PUBLICATION



URBAN BUSINESS PROFILE

MACHINE SHOP JOB WORK



**U.S.
DEPARTMENT
OF
COMMERCE**

Economic
Development
Administration

Office of
Minority Business
Enterprise

URBAN BUSINESS PROFILE

MACHINE SHOP JOB WORK

SIC 35993

April 1972
EDA-72-59591

**Prepared for
ECONOMIC DEVELOPMENT ADMINISTRATION
in cooperation with
OFFICE OF MINORITY BUSINESS ENTERPRISE**

U. S. DEPARTMENT OF COMMERCE
Washington, D.C. 20230

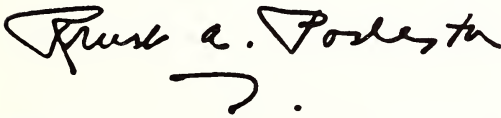
Peter G. Peterson, Secretary
Robert A. Podesta, Assistant Secretary
for Economic Development
John L. Jenkins, Director
Office of Minority Business Enterprise

This report was prepared by Boise Cascade Center for Community Development, Washington, D.C., under contract with the Office of Economic Research, Economic Development Administration. The statements, findings, conclusions, recommendations, and other data in this report are solely those of the contractor and do not necessarily reflect the views of the Economic Development Administration.

FOREWORD

As part of a continuing program to provide encouragement and assistance to small business ventures, the U.S. Department of Commerce is issuing a series of Urban Business Profiles.

It is hoped that these reports will serve as a meaningful vehicle to introduce the prospective small urban entrepreneur to selected urban-oriented businesses. More specifically, a judicious use of these profiles could: provide a potential businessman with a better understanding of the opportunities, requirements, and problems associated with particular businesses; provide guidelines on types of information required for location-specific feasibility studies; assist urban development groups in their business creation activities.

A handwritten signature in black ink, reading "Robert A. Podesta". The signature is fluid and cursive, with a large initial "R" and a stylized "P".

Robert A. Podesta
*Assistant Secretary
for Economic Development*

Table of Contents

	Page
I. Recommendation	1
II. Description of the Machine Shop Industry	1
A. Identification	1
B. Dimensions	2
Cyclical Factors—Single-Industry Ties—Captive Operations—Imports	
C. Characteristics	4
Nature of the Product—Nature of the Customer —Technology—Competition—Ease of Entry— Financing—Profitability—Dependence on Out- side Factors	
III. Feasibility Analysis	9
A. Review of Key Factors	9
Management—Market—Location— Machinery—Work Force	
B. Special Factors for New Minority Ventures	10
Advantage—Disadvantage	
C. Projections of Attainable Returns in Industry	11
Small, Three-Man Operation— Medium-Sized, 15-Man Operation	
IV. Establishing the Business	13
A. Approaching the Market	13
B. Plant Requirements	13
C. Financing	14
Small Operation—Medium-Sized Operation	
D. Labor Force	15
V. Summary	16

BIBLIOGRAPHY/TRADE ASSOCIATION

OFFICE OF MINORITY BUSINESS ENTERPRISE (OMBE) AFFILIATES

URBAN BUSINESS PROFILES

URBAN BUSINESS PROFILE

Machine Shop Job Work

(SIC 35993)

I. Recommendation

Successful operation of a machine shop which specializes in job work requires technical experience and strong managerial talents. Individuals wishing to enter the industry as shopowners should have considerable experience and very high motivation.

If a new machine shop is located in a metropolitan area where manufacturing activities are growing, it should have good prospects for success—if management is technically competent, resourceful, willing to work long hours, and dedicated to controlling costs. Risk can be minimized if the market for the proposed new job shop is clearly defined and substantiated by information received from prospective customers.

Investment requirements are minimal provided that the owner shows ingenuity in finding inexpensive space, securing second-hand machinery, and/or arranging for leasing more expensive equipment. Careful attention should be paid to the availability of a technically competent work force, particularly when there is a high demand for machine shop services. At such times, it is often difficult to secure the skilled labor which is required.

II. Description of the Machine Shop Industry

A. Identification

A machine job shop, Standard Industrial Classification (SIC) 35993, is a service-oriented activity providing custom service to repair, make, or otherwise improve an existing manufactured product or a new product of the same kind. All items are custom made. There is some overlapping between the operation of a machine job shop and a

tool-and-die shop, since many machine job shops manufacture tools and dies, and some tool-and-die shops machine parts to order, as well as design and build special machinery. Many machine job shops specialize in the repair and reconditioning of machinery, and a typical aspect of their work is the availability of repair service on a 24-hour basis.

Many of the technical, financial, and operational aspects of machine job shops and tool-and-die makers are similar. However, tool-and-die makers tend to have more complicated and expensive machinery, often using numerical controls, and they are somewhat larger. The average tool and die shop employs about twice as many persons as the average job shop.

The essential operation of a machine job shop is to take a piece of metal and alter it to the customer's specifications. This may include plating, assembly welding, fabricating, diecasting, stamping, or grinding, or any combination of these operations. In most cases the metal is supplied by the customer. Various types of metal forming machinery, such as lathes, presses, planers, millers, and drills are used for this purpose. The most important shop costs are labor and investments in machines. An operation which can be accomplished quickly on a small and inexpensive machine will be less costly than a complicated and time-consuming operation on an elaborate machine. However, labor is more costly than machinery, and it is usually more profitable to use a more expensive faster machine than one which is slow but inexpensive.

B. Dimensions

There were some 3,000 machine shops employing 66,500 workers doing jobwork, according to the 1967 Census of Business. Their total sales were reported to be above \$1.2 billion. The National Tool, Die, and Precision Machining Association, which includes tool-and-die manufacturers as well as job machine shops in its definition of the industry, reports that there are about 7,000 firms in the industry doing \$3 billion of business annually. There are many other operations which are captive operations of other firms, and these latter do machine work only for the company by which they are owned.

Growth in the industry is directly related to growth in manufacturing and particularly the growth in the use of machinery. Thus, it can be expected that, with the continuing increase in population and standard of living, there will be corresponding increases in the value of manufactured output and the need for contract machining. Continuing introduction of laborsaving devices and other machinery are also bound to increase the output of machine shops.

There are significant factors affecting the independent contract firm. These include:

- Cyclical factors,
- Single-industry ties,
- Captive operations.

Cyclical factors. Machine job shops generally tend to be hurt by the ups and downs of business. When industrial output is not expanding, machines are used less intensively, and there is less need for repairs and special machine work. The machine shop industry generally has considerable excess capacity when industrial production is lagging and has insufficient capacity when production is booming.

Single-Industry Ties. Unless a machine job shop is large and located in an area where industry is diversified, its output tends to be specialized to serve one or two customers or a single industry. This leaves the machine shop operation overly dependent on customers over whom it has no control. This can result in seasonality of work, abrupt loss of work when a customer closes his plant or moves, loss of work if a particular industry is declining, and so on.

Captive Operations. Captive operations, which are shops owned by the companies which purchase their output, are always a threat to the independent. In recessions, captive operations get the work before a company provides any orders to outside suppliers.

Machine job shops tend to be located in the industrial concentrations of the Nation. They are particularly concentrated in and around the automotive industry and in places like Chicago. However, agriculture centers have machine shops serving agricultural machinery, and there are other concentrations serving the mining industry, the petroleum industry, and the logging industry. While urban centers are good locations because of their proximity to diversified manufacturing operations and the availability of used machinery and skilled labor, there are often opportunities to be found in other areas near industries which are expanding or which are introducing new machinery into their operations. For example, the rapid mechanization of coal mining and the surge in the demand for coal has resulted in a very rapid upsurge in machine shops in West Virginia and Kentucky.

There has been very little penetration into the machine shop industry by black or Spanish-speaking entrepreneurs. Ownership in the industry is concentrated among a group of persons, many of European extraction, who have established close working relationships with each other over a period of years. The National Tool, Die and Precision Machining Association does, however, report that at least one of its members is a black owner of a machine shop.

C. Characteristics

1. *Nature of the Product*

The contract machine shop serves other industries. It provides machine time, technical skills, and know-how. It uses its customers' materials and works them to repair or produce new parts for existing machines, and turns out relatively small quantities of parts and other metal items needed in the manufacturing process.

2. *Nature of the Customer*

The customer of a machine shop is anyone who uses machinery, whether he be manufacturer, farmer, miner, logger, transporter, etc. The basis for choosing a particular machine shop can be any one or combination of the following:

a. *Convenience.* The machine shop is handy and can quickly provide and deliver the required service.

b. *Quality.* The machine shop can be relied upon to provide accurate machining to very close tolerances, or to repair machines.

c. *Price.* The machine shop can perform work at an economical cost. (Much business is secured through competitive bidding.)

d. *Ingenuity.* The machine shop can figure out a way of doing something more quickly or more economically, or can modify a machine to make it work more effectively.

A machine shop may have a number of different types of customers. If the shop makes tools, dies, molds, and other forms, its customers will be the manufacturers who produce other products (such as automobiles, appliances, aerospace products, etc.).

Other types of machine shops specialize in one-of-a-kind jobs, machining or welding a particular part needed for the operation of another machine. Many shops also specialize in repairing and maintaining machinery particular to a specific industry such as textile manufacturing, mining, agriculture, and the like.

In most cases, the machine shop must be located close to its customers. There are some exceptions, particularly in imports from Canada and Europe in tool-and-die production, but the imports have a cost advantage in labor rates which would not be applicable to operations in the United States located at a distance from customers.

3. *Technology*

The machine job shop is an outgrowth of the Industrial Revolution. It had its first development in the early 19th century when Eli Whitney invented interchangeable parts for guns. Most of the early equipment was used on wood, and much of the basic machinery performs

the same operations today which were performed by the early wood-working machinery of the 19th century. Technological changes have come from size of machines, speed of operation, ability to work with more complicated metals, closeness of tolerances, and capability of using more highly automated controlling devices.

The technology involved in operating a modern machine shop is quite complex. The manager must know mathematics, mechanics, metal engineering, the theory of metal cutting, the properties of various metals and alloys, and the workings of machines.

In addition, a manager must know cost estimating, plant layout, and wage and salary administration. Quality control is an essential ingredient of successful machine shop management, as are careful estimating and rigid control of costs.

Machine shops may be classified by the size of job orders and the degree of precision to which they work. For example, a shop may specialize in light jobs weighing less than 10 pounds when completed, medium work, weighing between 10 and 50 pounds, and heavy work, which may weigh up to several tons when completed.

Rough work is that in which finishes are seldom smoother than 125 micro-inches and tolerances seldom better than 0.007 inches. Medium work finishes are seldom smoother than 63 micro-inches and tolerances down to 0.002. In fine work, finishes may be as smooth as 8 micro-inches and tolerances as close as 0.0002.

Machine shops may specialize in different types of metal, such as steel, aluminum, or bronze, or in the case of the aerospace industry such exotic alloys as titanium, beryllium, and the like.

The machines to be purchased for a machine shop will depend upon the nature of the market the owner wishes to serve and the technical requirements for machinery to produce for that market. The prospective owner must have a clear idea of how large his work will be, what precision will be expected, the type of metals with which he will be working, whether numerical tapes will be available for automatic operation, and so on.

There are some one-machine shops where the total output is performed on one machine having unique properties such as the ability to perform very heavy work, or the ability to work at very high speeds with consequent savings in costs. Such machines are usually automatically controlled and expensive.

A machine shop is generally labor-intensive with a moderate investment of \$7,000 to \$10,000 per worker required. Total wages for the industry as a whole represent about 44½ percent of the total value of the work performed in the industry.

The basic skill utilized in the labor force is that of the skilled machining worker. The various occupational titles for this skill are

listed in D.O.T. 600 through 607.886, 609.280 through .782 and 609.885, in the *Dictionary of Occupational Titles*, U.S. Department of Labor, third edition (1966).

Most training authorities believe that apprenticeship is the preferred way to learn the machinist trade. While a typical apprentice program lasts 4 years, many companies have training programs that qualify their employees as machinists in less time. Training includes the operation of various types of machine tools and such skills as chipping, filing, handtapping, dowel fitting, riveting, and other hand operations. A machinist must also know blueprint reading, mechanical drawing, shop mathematics, and shop practices. The National Tool, Die and Precision Machining Association conducts an apprenticeship program in cooperation with those of its members who wish to participate.

Depending on the type of work done, the average machine shop might have about half the work force skilled, a third semiskilled, and the balance in unskilled or learner category. About 75 percent of the workers in the industry are nonunion, although in some areas union membership is the practice. Wages are generally high, ranging in 1970 from about \$3.50 an hour in low-wage areas to about \$6 an hour in the areas where higher wages are more common.

4. Competition

As in most industries where there are generally a large number of small suppliers and it is relatively easy to enter, competition can be intensive. When work is scarce, competitors tend to shave prices and forget about overhead. However, during rush seasons, work can be found very easily, particularly if delivery schedules can be maintained.

The machine shop also faces competition from the captive operation that is owned by a manufacturer or by the in-plant toolroom. Many manufacturing operations which reach a certain size will install a toolroom of their own to do many machining operations and to maintain and repair machinery. This can often result in the machine shop's losing an important customer. However, a job shop offers a manufacturer many advantages over an in-house operation, including lower cost in some instances, greater flexibility, and higher skills. These can be marketed aggressively.

The introduction of new machinery can often make business difficult for a machine shop that is attempting to compete on a relatively large scale for the production of tools and dies or molds. Financing must often be found for new machinery or else the business must be given up.

As noted above, there is a certain amount of clannishness within the industry, and competitors may help each other by making machine time available on certain types of machines. While this has ad-

vantages for those who are already in business, it may pose problems for a newcomer not known by or friendly with existing shopowners.

5. *Ease of Entry*

Machine job shops still offer opportunities for small entrepreneurs because customers are always looking for reliable suppliers who can be depended upon to deliver orders quickly and according to exact specifications. This places a premium on geographical proximity to customers, flexibility of operations, and careful craftsmanship, all of which become more difficult characteristics to maintain as the size of operation increases. Given the qualifications for operation of a machine shop and a market for his services, an individual can become a machine shop operator with relative ease. There are no special licensing requirements or unusual capital needs.

Many owners of job shops got their start by picking up one second-hand machine for less than \$1,000, reconditioning it themselves, and operating it at nights and weekends in their basements or garages. As business increased, they secured more machines, hired some friends or relatives, and eventually moved into a small garage-type building.

On the other hand, the industry would be impossible to enter successfully if one did not have solid experience in the field and a broad range of acquaintanceship with potential customers. Moreover, the industry would be particularly difficult to enter during one of its many periods of excess capacity. Entry is most easily accomplished when work is easy to find and customers are desperately searching for places to get their contract machining accomplished.

6. *Financing*

An experienced operator with some connections with potential customers and a good personal credit record should experience relatively little difficulty securing the necessary financing. Little or no investment is required for materials. Used machines can be purchased relatively cheaply or new machinery can be leased. Firm orders can usually be used as collateral to obtain bank loans for wages and supplies; the loans are expected to be retired by order payments.

The actual amount of money needed for investment will vary greatly. An individual wanting to purchase all new machinery for cash in a building all his own would need perhaps \$125,000 in capital for a relatively small operation with sales of about \$250,000 annually. However, as noted above, it is possible to use someone else's machine and start with nothing. Somewhere in between, an experienced individual who has enough work for two or three others, in addition to himself, and who can secure some leased space without putting up a lot of money for a lease, ought to be able to get started with about \$2,500 of his own capital and about \$7,500 of borrowed funds.

7. Profitability

Although the potential for profitability in a job shop operating at 100 percent of capacity over a long period of time is high, the actual profitmaking potential for the average shop is relative low and is often achieved only at the expense of long hours of work and overtime by the owner-manager. Profit-reducing factors include:

a. Keeping workers on the payroll when there is no work. Many owners will keep workers on the payroll when there is no work out of consideration for the worker's welfare or because work is expected and the owner does not want a valuable employee to go elsewhere. If the expected work is delayed or does not materialize, the drain on profits can be significant.

b. Investment in new machinery and equipment. While an individual starting on a small scale may be content with secondhand machinery, there is always a temptation, once a business is established, to invest in more elaborate machinery on the assumption that the addition will make it possible to bid on a greater variety of potential contracts. If the assumption proves overoptimistic, the payments on the idle machine can drain away profits. However, it is better to have idle machines than idle men.

c. Seasonal and cyclical factors. Shops generally tend to have too much work or not enough. During rush seasons or a booming economy, extra help must be found, productivity goes down, overtime goes up, and profits are not as great as might be expected. During slack time, machines and men are idle, and profits are affected correspondingly.

d. Quality control. As business grows, it becomes more and more difficult to control quality. This means that material is sometimes wasted and must be replaced at a cost. It may also mean taking longer to perform an operation than estimated, a factor which would reduce profits on individual contracts and may even result in losses.

e. Competition. Competition is often intense, not only from captive shops and in-house toolrooms, but from new entrants into the business whenever times are good and work is plentiful.

There are no specific figures on actual profitability, but the range of profits for firms in the miscellaneous machinery field (SIC 3599) and metalworking machinery and equipment, which includes tool-and-die, suggests an average rate of net profit somewhat under 4 percent of sales. Thus, a firm employing about 15 persons and doing an annual business of approximately \$250,000 might generate annual profits of somewhat less than \$10,000, not including the owner's direct labor.

8. *Dependence on Outside Factors*

As pointed out above, there are many factors outside the control of the owner of a machine job shop which would affect his profitability. These would include the following:

a. Decision by major customers to install or expand their in-house machining capabilities.

b. National business cycle. Machine shops would be affected more than most businesses by the ups and downs of the national economy.

c. Long-range or short-range trends in the industries served. The prosperity of machine job shops is affected by what happens in the major industries they serve. Those catering to the automotive industry tend to do well or poorly on the basis of how well the auto industry is doing. Others are affected by mining, aerospace industry, etc.

III. **Feasibility Analysis**

A. **Review of Key Factors**

These factors are essential to feasibility of a machine job shop:

1. *Management*

The proposed management must be technically competent, experienced, and highly motivated toward making profits. In the absence of other factors suggesting unusual competence, at least 10 years of experience in the industry, 3 of which have been spent in supervisory capacities, are the very minimum which should be required of the management. In addition, there must be something in the proposed management's background which indicates a profit orientation, such as skill in handling his personal finances, or previous successful experience. The extent to which a prospective manager knows his precise market, where he is going to get his machinery, and has shown cost consciousness in his initial projections would also be indicative of the likelihood of success.

2. *Market*

A very specific market should be identified to assure feasibility. Such a market may be identified by the following:

a. A nearby booming industry which is unable to get all the contract machining it needs. Interviews with purchasing agents can establish the existence and size of such a market. Some judgment should be made as to the prospects for continuation of the boom.

b. Acquaintanceship by the proposed management with sources of business and reasonable assurances by such sources of an adequate

volume. There may be special factors here, such as a willingness to help minority entrepreneurs, but reliance on such a special factor should be approached cautiously.

c. Knowledge of a need for a new technical procedure or introduction of a new machine which can be offered by the proposed new shop at a competitive advantage. This, too, can be documented by interviews.

d. A special factor such as location or technique that offers an opportunity to prospective customers to get work more conveniently or more inexpensively. The requirement for such convenience or economy should also be documented by interviews.

3. *Location*

The proposed location should be such that the proposed market can be served inexpensively and conveniently and rental is minimal.

4. *Machinery*

The machinery required must be available at a cost commensurate with the sales and cost projections for the proposed shop.

5. *Work Force*

Depending upon the size needed, there should be assurance that the required work force is available. It is often true that the available work force, more than any other factor, limits capacity. Thus, if there is an unfilled demand for contract machining in a particular area or region, the problem is more apt to be related to the inability to secure a work force than to any other. If there were existing manpower competent to perform the required work, the existing shops could put them to work by putting on second and third shifts or adding machines. Thus, a newcomer to the business within a specific area cannot expect to succeed because there is an unfilled demand for contract machining unless he has a solution to the manpower shortage.

B. Special Factors for New Minority Ventures

A minority entrepreneur seeking to establish a new machine shop would have one potential advantage and one potential disadvantage with regard to existing shops. All other factors would be potentially neutral.

1. *Advantage*

As indicated above, many large manufacturing and other concerns are under somewhat extensive pressures to exhibit concern for minority economic development. Thus, a minority-owned machine job shop might receive special considerations from purchasing agents.

It should be stressed, however, that such special considerations would not extend to paying a premium for the work or accepting work that is not up to standard. Thus, a minority business would be expected to produce quality work at competitive cost.

There would be limitations on the amount of preference which might be exhibited toward minority machine job shops. With many small existing jobs already in the business, a small shift in work might well have a disastrous effect on one or two existing shops, and such an eventuality would have to be taken into account by all concerned.

2. *Disadvantage*

As also indicated above, existing owners of machine job shops tend to have ethnic and family relationships and might tend to view entrance of a minority entrepreneur with more hostility than that normally felt with the advent of a business competitor: This might lead to excessively competitive practices, such as heavy price-cutting, to the detriment of the new business. At the very least, it would make it difficult to secure the cooperation that now exists among many firms in the industry.

C. **Projections of Attainable Returns in Industry**

Projections are furnished below for two different types of operations. The first is for a small three-man operation on two or three basic machines. The second is for a larger operation employing about 15 persons.

1. *Small, three-man operation*

a. Revenues (includes small amount of income from sale of waste materials such as metal cuttings)	\$40,000	
b. Operating expenses (all materials supplied by customers)		
1) Direct labor (including proprietor's direct labor)	25,000	
2) Other (includes power, selling expense, cost of transportation, consumable supplies, rent, etc.)	8,000	
Total operating expenses	33,000	
Percent of sales		82.6%
c. Gross operating profit	7,000	
Margin		17.4%
d. Other expenses (interest, depreciation, taxes)	4,000	
e. Net profit	3,000	
Percent of sales		7.6%
f. Investment	5,000	
g. Return on investment		60.0%

A high return on investment is shown for an operation of this type, because it is assumed that relatively little investment is required and that the entrepreneur has been able to find a facility (such as his garage or comparable) which does not require heavy preparation for machines. It is also assumed that the machines can be secured on lease

or secondhand with relatively small downpayment. Very little depreciation is assumed. It is also assumed that there is relatively steady work for the three persons and that they are able to work on billable contracts for about 80 percent of the time. This may require some unpaid overtime on the part of the owner.

There are three major risks involved in setting up an operation of this type: (1) the work may not come in; (2) the machinery will break down; (3) the workers will not be available. However, an experienced man who knows the machinery and who has lined up reliable workmen and sufficient contracts may reasonably expect profitable operations from the very beginning. Due to the cyclical nature of this business, however, the prospects of maintaining profitability at this level will probably diminish as the volume of available work fluctuates over time. It is unlikely that an operation of this size can last long since it will either go out of business as soon as there is no work, unless the new firm is unusually well capitalized, or else it will attract enough business to grow and expand, secure more machinery, and hire a larger work force.

2. Medium-sized 15-man operation

a. Annual revenues	\$250,000	
b. Operating expenses		
1) Direct labor (includes overtime and owner's direct labor) ...	112,500	
Percent of Revenue		45.0%
2) Manufacturing expense (includes indirect labor, fringe benefits, depreciation, tools and supplies, power, light, heat, etc.) ...	61,875	
Percent of direct labor		55.0%
3) Selling expense (includes delivery)	39,375	
Percent of direct labor		35.0%
4) Administrative expense	16,875	
Percent of direct labor		15.0%
Total operating expenses	230,625	
Percent of sales		92.2%
c. Gross operating profit	19,375	
Gross margin		7.8%
d. Other expenses (interest on capital of about \$100,000)	10,000	
e. Net profit	9,375	
Percent of sales		3.7%
f. Investment	25,000	
g. Return on investment		37.5%

NOTE: The above figures exclude materials. These are most often supplied by the customer, but even when they are supplied by the vendor, they are generally furnished at cost.

Given good management and a carefully chosen location with respect to markets, the chances are better than even that the above profit can be earned on the average over a number of years. However, the risk would be slightly higher in any given year depending on the business cycle and the current conditions in the principal industry being served.

IV. Establishing the Business

A. Approaching the Market

Whether he is contemplating a small operation or a medium sized operation, the prospective entrepreneur for a machine job shop should have a very clear idea of his market, backed up by interviews with prospective customers, and commitments, if possible.

This should be the first step in establishing a machine job shop, and if it has not been accomplished, there is no point in going any further in planning to establish a business.

The approaches to the prospective market may be based upon convenience, technical competence, price, friendship, or good will, or any combination of these. The prospective entrepreneur should establish the basis on which he expects to solicit the business and then visit potential customers to determine whether such a basis is valid.

The new entrepreneur should be careful not to depend upon promised opportunities to bid on contracts in formulating his own business plans, unless the potential customer's assurance appears based on a realization of cost advantages (by virtue of location, skill, machines used) in the proposed business relationship.

B. Plant Requirements

The small operation should seek minimum space, either in a garage or some similar structure. An existing business (not a competitor) may be willing to rent out a small amount of space. Room will be needed for a workbench and for whatever machines are considered essential to the type of work which is available and which the operator plans to get.

For the medium-sized operation, the operator should seek ground level space of about 1,200 to 1,500 square feet in a cement floor building, with enough room for a small office, a storeroom, a tool-crib, a space for finished parts, three workbenches, milling machine, two turret lathes, engine lathe, hacksaw, three drills, and three grinding machines. A furnace may also be required for heat treating tools, and electric welding equipment may also be desirable.

Most metropolitan areas have a number of suppliers of machine tools and a prospective job shop operator should make the rounds of these suppliers to ascertain the availability of secondhand machinery. Assuming the purchase of good secondhand machinery, and the acquisition of one or two real "bargains" at an auction, it is estimated that the necessary equipment can be secured for about \$100,000. This would include special costs of installation.

C. Financing

The basic investment involved in machine job shops is the purchase of machinery. Since machinery has considerable value in secondhand condition, most machines can be financed with relatively little difficulty. Often, the seller will arrange for financing, or arrangements can be made for leasing machines from the seller or from an equipment leasing firm with an option to buy. Some cash outlay would be required for installation of machines and for expendable supplies such as office supplies, transportation equipment, cutting bits, hand tools, and the like. About 1 month's working capital would be required to cover rent, operating expenses, and wages.

Some typical financial arrangements might include the following:

Small Operation	
Capital required:	
Machinery installed	\$ 5,000
Working capital	3,000
Supplies, etc.	2,000
	<u>\$10,000</u>
Source:	
Own funds	\$ 2,500
Bank loan	7,500
	<u>\$10,000</u>

Given the requisites for successful operation, it should be relatively easy for a bank officer to approve a small loan for such an operation. If the requisite conditions are not present, the business is not viable and should not qualify for a loan.

In most cases, the bank loan could be secured through a guarantee by the Small Business Administration, which has a special program to promote minority enterprises, and which might be expected to co-operate.

Medium-Sized Operation	
Capital required:	
Machinery installed	\$ 90,000
Working capital	25,000
Supplies, etc.	10,000
	<u>\$125,000</u>
Source:	
Equipment loan	\$ 75,000
Own funds	25,000
Bank loan	25,000
	<u>\$125,000</u>

It is likely that most of the machinery can be financed and that the bank loan can be secured through a Small Business Administration guarantee. In the event the proposed operator does not have the

required \$25,000, it would be well to consider a small operation, perhaps employing one to three men. However, in exceptional circumstances, where an unusual individual with the necessary experience and business management ability has an opportunity to enter a market and make a success of contract machining on a somewhat larger scale, and he cannot secure \$25,000 from his own funds, he may be able to secure funds from a local source specializing in providing equity for minority businesses.

D. Labor Force

As indicated above, a skilled work force is essential to the successful operation of a machine job shop. For a small operation, the work force should be nearly all skilled. (For a three-man operation, two skilled machinists and an apprentice might be appropriate.)

A labor force breakdown for a 15-man operation might include:

Manager	1
Foreman	1
Skilled	6
Semiskilled	4
Unskilled	2
Office	1
	<hr/>
	15

The foreman or shop supervisor is a key to successful operation. He can see to it that the work force is kept busy, that the machines are scheduled for maximum productivity, that work commitments are met, and that quality control standards are maintained.

It is often possible to start a shop of this size with two principals, one serving as the foreman-supervisor, and the other as the business manager-salesman.

Prospective operators of a new business should have a very clear idea of where they will get their key employees. In boom times, skilled machinists are exceptionally hard to recruit, and unless a new entrepreneur knows of some men who are capable and willing to come with him, it would be wise to give up the idea until such men are found.

Wage scales and union affiliation are influenced heavily by local conditions and cannot be generalized on a national basis. While most machine job shops are nonunion, it is important in certain areas that they be unionized. Wage scales can vary extensively from one section of the country to another. A prospective operator of a job shop should know the going level in the area in which he intends to locate and adjust his figures accordingly.

V. Summary

For an individual who knows the machine shop technique, who is experienced in the trade, and who is a good businessman, there are opportunities to establish and to make money in the ownership and operation of a machine job shop. Such an individual will know in advance what his market is and how he intends to capture it and keep it. He will know who his customers are going to be and why they will purchase from him rather than from others. He will know what machines he wants and how he can get them at a bargain and for relatively little investment. He will know where he will get a reliable labor force. If he does not know these things, then he is not ready to establish a machine job shop.

BIBLIOGRAPHY

SMALL BUSINESS BIBLIOGRAPHY NO. 69, MACHINE SHOPS-JOB TYPE, June 1968, free. Ten-page pamphlet giving brief description of operations along with applicable bibliographic listings of selected references. *Small Business Administration*, Washington, D. C. 20416.

Books

Armstrong, William H. *Machine Tools for Metal Cutting*, \$5. Technical information on the materials, tools, and manufacturing processes used in machine shop.

Black, Paul H. *Theory of Metal Cutting*, 1961. \$8.95. Discusses the "metal-cutting mechanism" and the mechanics of what happens near the cutting edge of a mechanical cutting tool during the machining process.

Doyle, Lawrence E. *Metal Machining*. \$11. Gives elementary description of metal machining equipment, methods, and techniques, including the engineering significance and application of metal machining through a study of process planning.

Fundamentals of Tool Design. American Society of Tool and Manufacturing Engineers, 1962. Paperback, \$2.50. Presents the principles of tool design for four basic manufacturing processes—material removal, joining, casting, and pressworking processes.

Hall, Herbert D., and Horace E. Linsley. *Machine Tools—What They Are and How They Work*. 1957. \$5.50. Introduction to fundamentals of mass production—the tools, machines, gauges, and methods that make up modern metalworking industries and automated production lines.

Hine, C. R. *Machine Tools for Engineers*, second edition. 1959. \$10.50. Treats the fundamentals of machine tools.

Immer, John R. *Layout Planning Techniques*. 1950. \$7.95. Discusses basic principles of production flow and layout and methods for solving layout problems.

Jones, Franklin D. *Machine Shop Training Course*, 2 volumes, \$6 each, \$10 per set. Standard treatise on machine shop practice.

LeGrande, Rupert. *New American Machinist's Handbook*. Metcut Research Associates, Inc., 3890 Rosslyn Drive, Cincinnati, Ohio 45209. \$13.

Machining Data Handbook. 1966. \$12.50. Lists by trade designations more than 850 alloys; categorizes each as to hardness, condition, and response to heat treatment, and makes machining recommendations.

Metals Engineering—Processes. American Society of Mechanical Engineers. 1958. \$13.50. Treats designing for processes, such as casting, forging, stamping, metallizing, milling, turning, spinning, welding, and gives their scope, advantages, and limitations.

Nordhoss, W. A. *Machine-Shop Estimating*, second edition (1960). \$12.50. Explains methods for determining the time required to do machining operations; an aid to quick, reliable estimating.

Oberg, Eric and Franklin K. Jones. *Machinery's Handbook*. 1964. \$14. Mathematical and mechanical tables, standards, rules, formulas and general data useful in machine shop operations.

Pappas, F., and R. A. Dimberg. *Practical Work Standards*. 1962. \$8.50. Shows how to establish specific labor costs, to determine plant schedules, to justify spending for capital investment, to determine plant and production-line layouts, to set up incentive pay programs, and to make other practical work decisions.

Parsons, C. W. S. *Estimating Machining Costs*. 1957. \$9. A guide to estimating the costs of machine-tool operations.

Also published is a series of booklets from data extracted from the *U. S. Air Force Machinability Reports*, Air Force Materials Laboratory, Wright-Patterson Air Force Base, Ohio 45433. Examples are: *Machining Data for Numerical Control*. \$1.50. *Matching Data for Titanium Alloys*. \$1.50. *Grinding Ratios for Aerospace Alloys*. \$1. *Machining Data for Beryllium Metal*. \$1.

Machine Tools for Sale

Industrial Machinery News. Monthly. \$5 a year; 50¢ a copy. (16239 Meyers Road, Detroit, Michigan 48235). Concerned with the buying and selling of metalworking machinery and equipment.

Industrial Market Place. Every 3 weeks. (2725 W. Howard St., Chicago, Illinois 60645). Advertising on used industrial equipment.

Machine Shop Magazine. Monthly. \$6 a year; 50¢ a copy. Thomas Skinner & Co., Ltd., 111 Broadway, New York, New York. 10006.

NTDPMA Journal. Monthly. Free to members. National Tool, Die and Precision Machining Association, 1411 K Street, N. W., Washington, D. C. 20050. Also publishes a *Buyers Guide* for the tool-and-die industry. Write direct for information.

Surplus Record. Monthly. \$4 a year; 50¢ a copy. (20 N. Wacker Drive, Chicago, Illinois 60606). Classified index of industrial machinery advertised by dealers and rebuilders. Free to buyers of machinery and equipment for industrial firms.

Used Equipment Directory. Monthly. \$1 a copy. (30 Vesey Street, New York, New York 10007). Lists available used machine tools and heavy industrial machinery, with dealers' names and addresses.

Shop Operations

American Machinist/Metal Working Manufacturing. Biweekly. \$3 a year; 75¢ a copy. McGraw-Hill Publishing Co., 330 West 42nd St., New York, New York 10036.

Cutting Tool Engineering. Monthly. \$6 a year; 50¢ a copy. Technifax Publications, 704 East Willow Ave., Wheaton, Illinois 60187.

Grinding and Finishing. Monthly. \$6 a year; 50¢ a copy. Hitchcock Publishing Co., Hitchcock Building, Wheaton, Illinois 60187.

Grits and Grinds. Monthly. Free. Norton Co., 3 New Bond St., Worcester, Massachusetts 01606.

Iron Age. Weekly, \$2 a year; 50¢ a copy. Chilton Co., Chestnut and 50th Streets, Philadelphia, Pennsylvania 19139.

Iron and Steel Engineer. Monthly. \$7.50 a year; \$1.50 a copy. Association of Iron & Steel Engineers, 1010 Empire Building, Pittsburgh, Pennsylvania 15222.

Machinery. Monthly. \$10 a year; \$1 a copy. Industrial Press, 93 Worth Street, New York, New York 10013.

Machine and Tool Blue Book. Monthly. \$7.50 a year. Hitchcock Publishing Co., Hitchcock Building, Wheaton, Illinois 60187.

Metal Finishing. Monthly. \$5 a year; 65¢ a copy. Metals and Plastics Publications, Inc., 99 Kinderkamack Road, Westwood, New Jersey 07675.

Mill and Factory. Monthly. \$10 a year; \$1 a copy. Conover-Nast Publications, Inc., 205 East 42nd Street, New York, New York 10017.

Modern Machine Shop. Monthly. Free, controlled circulation. Gardner Publications, Inc., 431 Main Street, Cincinnati, Ohio 45202.

Plant Engineering. Monthly. \$10 a year; \$1 a copy. Technical Publishing Co., 308 East James Street, Barrington, Illinois 60010.

Production Equipment. Monthly. Wilson-Carr, Inc., 407 South Dearborn Street, Chicago, Illinois 60605.

Steel Weekly. \$25 a year. Penton Publishing Co., Cleveland, Ohio 44113.

Tool and Manufacturing Engineer. Monthly. \$6 a year; 50¢ a copy. American Society of Tool and Manufacturing Engineers, 10700 Puritan Avenue, Detroit, Michigan 48238.

The Machinist. Weekly. \$3 a year; 10¢ a copy. International Association of Machinists and Aerospace Workers, 1300 Connecticut Avenue, N. W., Washington, D. C. 20036.

Technology

ASM Review of Metal Literature. Monthly. \$20 a year. American Society for Metals, Metals Park, Ohio 44073. Abstracts about 12,000 reports yearly from world literature; classifies subjects with code symbols for each abstract (ASM-SLA Classification of Metallurgical Literature).

Applied Science and Technology Index. Monthly. H. W. Wilson Co., 950 University Ave., New York, New York 10016. Publishes about 77,000 references a year to articles in 200 English language journals on science and technology in aeronautics, communications engineering, construction, electrical engineering, instrumentation and control, mechanics, metallurgy, and transport engineering.

The Engineering Index. Monthly. For price, write to: The Engineering Index, Inc., 345 East 47th Street, New York, New York 10017. Price includes weekly card service in 249 subject divisions. Carries over 34,000 abstracts yearly from world literature on subjects such as aerospace sciences, civil engineering, computers, electrical engineering, engineering materials, industrial economics, instrumentation, marine and naval engineering, mechanical engineering, and other technology.

TRADE ASSOCIATION

The principal trade association serving machine job shops is the National Tool, Die and Precision Machining Association. This association has over 1,000 members, many of whom produce tools, dies, and molds, in addition to performing contract machining and machinery repair.

NTDPMA is located at 1411 K Street, N. W., Washington, D. C. 20005. It was established in 1943. In addition to representing the industry in Washington, NTDPMA conducts, through its membership, an apprenticeship program; conducts management workshops; publishes a newsletter and management aids; carries on a public relations campaign on behalf of the industry; and provides management counseling.

OFFICE OF MINORITY BUSINESS ENTERPRISE (OMBE) AFFILIATE ORGANIZATIONS

Albuquerque

National Economic Development
Association (NEDA)

1801 Lomas, N. W.
Albuquerque, N. M. 87104
508/843-2386
Victor M. Casaus,
Regional Vice President

Atlanta

Atlanta Business League (NBL)
329 Walker Street, S. W.
Atlanta, Georgia 30314
404/524-5449
Franklin F. O'Neal, Executive Director
Wendell White (OMBE Representative)
404/526-6304

Baltimore

Morgan State College Minority
Business Enterprise Project
2108 North Charles Street
Baltimore, Maryland 21218
301/685-0610
Ralph J. Ross, Executive Director

Boston

The Roxbury Small Business
Development Center
126 Warren Street
Roxbury, Massachusetts 02119
Bernard Wiley—Acting Executive
Director
617/427-6333
Frank Bispham (OMBE Representative)
617/223-2381

Chicago

Chicago Economic Development
Corporation (CEDC)
162 North State Street, Suite 600
Chicago, Illinois 60601
231/368-0011
Garland Guice, Executive Director

Bennett Johnson, Jr. (OMBE Representative)

312/353-4460
NEDA
537 Dearborn South
Chicago, Illinois 60605
312/939-2607
Gilbert M. Vega,
Regional Vice President

Cincinnati

Determined Young Men
3880 Reading Road
Cincinnati, Ohio 45229
513/221-0180
Mervyn Stenson, Executive Director

Cleveland

Greater Cleveland Growth Corporation
690 Union Commerce Building
Cleveland, Ohio 44115
216/241-4313
Melvin Roebuck, Executive Director
Minority Economic Developers
Council (MEDCO)
10518 Superior Avenue
Cleveland, Ohio 44106
Armond L. Robinson, Administrator

Dallas

Dallas Alliance for Minority Enterprise
(DAME)
7200 North Stemmons Freeway
Suite 1006, UCC Tower
Dallas, Texas 75222
214/637-5170
Walter Durham, Executive Director

Denver

Colorado Economic Development
Association (CEDA)
1721 Lawrence Street
Denver, Colorado 80202
303/255-0421
Edward Lucero, Executive Director

Detroit

Inner City Business Improvement
Forum (ICBIF)
6072 - 14th Street
Detroit, Michigan 48208
313/361-5150
Walter McMurtry, President

El Paso

NEDA
First National Building
Suite 10B
109 North Oregon Street
El Paso, Texas 79901
915/533-7423
Jose Manuel Villalobos,
Regional Vice President

Indianapolis

Indianapolis Urban League
445 North Pennsylvania Street
Indianapolis, Indiana 46204
317/639-5391 or 253-5418
Sam Jones, Executive Director

Kansas City

Black Economic Union (BEU)
2502 Prospect
Kansas City, Missouri 64127
816/924-6181
Curtis McClinton, President

NEDA
703 North 8th Street
Kansas City, Kansas 66100
913/342-6663
Richardo Villalobos,
Regional Vice President

Los Angeles

South Central Improvement Action
Committee (IMPAC)
8557 South Broadway
Los Angeles, California 90003
213/751-1155
Louis Wilson, Director

The East Los Angeles Community
Union (TELACU)
1330 South Atlantic Boulevard
Los Angeles, California 90022
213/268-6745
Claude Martinez,
Director of Development

NEDA

5218 East Beverly Boulevard
Los Angeles, California 90022
213/724-6484
Silvestre Gonzales,
Regional Vice President
Jack Wilburn, Coordinator
213/824-7691
**Powell McDaniel (OMBE
Representative)**
213/824-7715
Joseph Luna (OMBE Representative)
213/824-7715

Memphis

Memphis Business League (NBL)
384 E. H. Crump Boulevard
Memphis, Tennessee 39126
901/574-3213
Leonard J. Small, Sr., Project Director
Harold Jones (OMBE Representative)
901/534-3216

Miami

NEDA
8551 Coral Way
Suite 307
Miami, Florida 33155
305/221-5531
Dr. Antonio Machado,
Regional Vice President

Newark

MEDIC Enterprises, Inc.
287 Washington Street
Newark, New Jersey 07102
201/642-8054

New Haven

Greater New Haven Business and
Professional Men's Association
226 Dixwell Avenue
New Haven, Connecticut 06511
Gerald S. Clark, Executive Director
203/562-3819

New York

Puerto Rican Forum, Inc.
156 Fifth Avenue
New York, New York 10010
212/691-4150
Hector I. Vasquez, Executive Director

New York (continued)

Capital Formation, Inc.
215 W. 125th Street, Room 313
New York, New York 10027
Hirom C. Cintron, Director, Harlem
Office
212/222-9650

Brooklyn Local Economic Development
Corporation (BLEDCO)
1519 Fulton Street
Brooklyn, New York 11216
212/493-1663
Preston Lambert, Executive Director

NEDA
19 West 44th Street
Room 407
New York, New York 10036
212/687-1128
David J. Burgos,
Regional Vice President

Philadelphia

Entrepreneurial Development
Training Center
1501 North Broad Street
Philadelphia, Pennsylvania
215/763-3300
Alphonso Jackson, Director

Phoenix

NEDA
Amerco Towers
2721 North Central
Suite 727 South
Phoenix, Arizona 85004
602/263-8070
Joseph Sotelo,
Regional Vice President

Pittsburgh

Business & Job Development
Corporation (BJDC)
7800 Susquehanna Street
Pittsburgh, Pennsylvania 15208
412/243-5600
Forrest L. Parr, President
Marian Diggs (OMBE Representative)
412/644-5529

Richmond

National Business League
700 North Second Street
Richmond, Virginia 23219
703/649-7473
Allen Roots, Acting Project Director

San Antonio

NEDA
1222 North Main Street
Kallison Tower, Room 422
San Antonio, Texas 78233
512/224-1618
Cipriano F. Guerra, Jr.
Regional Vice President
Jesse Rios (OMBE Representative)
512/225-5511

San Francisco

Plan of Action for Challenging
Times (PACT)
635 Divisadero Street
San Francisco, California 94117
415/922-7150
Everett Brandon, President

Seattle

United Inner City Development
Foundation
1106 East Spring St. - Xavier Hall
Seattle, Washington 98122
206/626-5440
Wilson Gulley, Executive Director

Washington, D. C.

Mayor's Economic Development
Committee (MEDCO)
1717 Massachusetts Ave., N. W.,
Room 704
Washington, D. C. 20036
202/667-6480
Michael D. Wallach, Director,
Business Assistance Center
Curley King (OMBE Representative)
202/967-5051
Howard University's Small Business
Guidance & Development Center
Post Office Box 553
Washington, D. C. 20001
202/636-7447
Dr. Wilford White, Director

Profiles of urban businesses are for sale at listed prices by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Beauty Shops (25 cents)	Furniture Stores (25 cents)
Bowling Alleys (30 cents)	Industrial Launderers & Linen
Building Service Contracting	Supply (30 cents)
(30 cents)	Machine Shop Job Work (30 cents)
Children's and Infants' Wear	Mobile Catering (25 cents)
(25 cents)	Pet Shops (30 cents)
Contract Construction (30 cents)	Photographic Studios (25 cents)
Contract Dress Manufacturing	Real Estate Brokerage (25 cents)
(25 cents)	Savings & Loan Associations
Convenience Stores (25 cents)	(30 cents)
Custom Plastics (30 cents)	Supermarkets (30 cents)
Dry Cleaning (25 cents)	Preparing a Business Profile (20 cents)

PENN STATE UNIVERSITY LIBRARIES



A000070942682